

REMARKS

In the Office Action mailed October 3, 2003:

Claims 6-11 were allowed.

Claims 12-22 were withdrawn.

Claim 1 was rejected under 35 U.S.C. 102(e) as being anticipated by Dishongh et al. (U.S. Patent No. 6,461,891).

Claim 1 was rejected under 35 U.S.C. 103(a) as being unpatentable over Shishido et al. (U.S. Patent No. 6,562,662 B1).

Reconsideration of this rejection is respectfully requested.

Claim 1 recites a ball-grid array package comprising a substrate and a metal cap having a side wall portion and a top portion that forms an internal cavity with a substrate. An epoxy encapsulant material fills a substantial portion of the internal cavity and contacts both an integrated circuit device within the cavity and the top portion of the metal cap.

In contrast to Applicants' invention, Dishongh et al. does not teach a package in which an epoxy encapsulant material fills a substantial portion of an internal cavity formed between a metal cap and a substrate. Instead, as shown in Figs 1-4, lid 10 of Dishongh et al. includes a solid central portion 12 and four sidewalls 14. A recess 16 is defined above the central portion 12 within the sidewalls 14 for hosting a first sheet of an indium alloy 18. Illustratively, the indium alloy includes bismuth, lead, indium and cadmium. The lid 10 and the alloy 18 are heated to above 155°C to melt down the indium alloy. The alloy 18 is then allowed to cool down to cause solidification within the recess 16 and a second sheet 22 (Fig. 5) is positioned on top of the alloy 18. Preferably, the second sheet 22 is also made of indium.

The lid 12 including the alloy 18 and the second sheet 22, as shown in Fig. 8 of Dishongh et al., is then flipped upside down and positioned on a semiconductor package 34 that is covered by a sheet 50 of a second alloy that may be the same as the first alloy. The two portions are heated again to a temperature above 135°C. The first 18 and second 50 alloys and the second sheet 22 melt at such temperature, dropping the lid 10 into contact with the package substrate 38 along its four sidewalls. When the structure cools down, the space between the lid 10 and the semiconductor package 34 is filled with the alloy mixture 52 (col. 4, lines 34-37). The lid 10 is then sealed to the substrate by an epoxy bead 54 (col. 4, lines 47-51).

Contrary to the Examiner's contention, element 52 of Dishongh et al., is not an epoxy encapsulant material. Element 52 is referred to repeatedly at col. 4, lines 35-44 and lines 52-67 as a mixture of the first 18 and second 50 alloys and indium sheet 22. The epoxy bead is

correctly referred to at col. 4, line 47 as element 54. In an obvious error, the element numbers are interchanged in a reference at col. 4, line 46 to mixture 54 and at col. 4, line 49 to epoxy bead 52.

Since Dishongh et al. does not teach a structure in which an epoxy encapsulant material substantially fills an internal cavity contacting both an integrated circuit and the top portion of the caps, claim 1 is not anticipated by Dishongh et al.

With respect to Shishido et al., the Examiner's position is unclear since there is no element numbered 13 in Fig. 9 of Shishido et al. or in any other figure of Shishido et al. If the Examiner intended to refer to element 64, this is not disclosed to be an epoxy encapsulant material, but merely an adhesive material (col. 5, line 32) or agent (col. 5, line 43). Since Shishido et al. does not teach or suggest every limitation recited in claim 1, claim 1 is patentable over Shishido et al.

In view of the foregoing, Applicants believe that all of the claims are now in condition for allowance and respectfully requests the Examiner to pass the subject application to issue. If for any reason the Examiner believes any of the claims are not in condition for allowance, he is encourages to phone the undersigned attorney at (650) 849-7777 so that any remaining issues may be resolved.

Aside from the fee for the Petition for Extension of Time, no additional fee is believed due for filing this response. However, if a fee is due, please charge such fee to Morgan, Lewis & Bockius LLP Deposit Account No. 50-0310.

Respectfully submitted,



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